Stoller
Grand Junction Office established 1959

299-W11-59 (A7301)
Log Data Report

Borehole Information:

Borehole:	299-W11-59 (A7301)		Site:	216-T-6 Crib	
Coordinates (WA State Plane)		GWL (ft)[1]:	Not deep enough	GWL Date:	1/13/2003
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
136,657.42 m	567,211.01 m	July 1947	216.514 m	87.2	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	0.67	8 5/8	8	0.3125	+0.67	87

The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS[3], and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing. Top of casing is cut unevenly. A reference point survey "X" is located at the top of the casing stickup.

Logging Equipment Information:

Logging System:	Gamma 1D		Type:	SGLS (35%)
Calibration Date:	9/2002	Calibration Reference:	GJO-2002-385-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3/Repeat	4	
Date	1/23/03	1/24/03	1/24/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	87.0	39.0	40.0		
Finish Depth (ft)	38.0	1.0	30.0		
Count Time (sec)	200	200	200		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A[4]	N/A	N/A		
Pre-Verification	AD051CAB	AD052CAB	AD052CAB		
Start File	AD051000	AD052000	AD052039		
Finish File	AD051049	AD052038	AD052049		

Log Run	1	2	3/Repeat	4	
Post-Verification	AD051CAA	AD052CAA	AD052CAA		
Depth Return Error (in.)	0	0	0		
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.		

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 118. During SGLS logging, fine-gain adjustments were not needed to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel. On 01/22/03, the sonde was run up and down the borehole one time to displace any radon gas if present.

Analysis Notes:

Analyst:	Sobczyk	Date:	02/03/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all outside the control limits, which were established on 12/05/2002. The pre-run verification spectra were all above the upper control limit for the 609-keV full-width at half-maximum value. In addition, pre-run verification spectrum AD052CAB was above the upper control limit for the 1461-keV full-width at half-maximum value. The post-run verification spectra were all below the lower control limit for the 2615-keV peak counts per second (cps). Post-run verification spectrum AD051CAA was below the lower control limits for the 609-keV and 1461-keV peak counts per second. The peak counts per second at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 9 and 13 percent lower at the end of each day. Examinations of spectra indicate that the detector functioned (i.e. decreasing efficiency throughout the day's logging) during all of the logging runs, and the spectra are provisionally accepted.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1DSept02.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. On the basis of Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing to total depth (87 ft). The casing correction factor was calculated assuming a casing thickness of 0.3125 in. This casing thickness is based upon the field measurement. A water correction was not needed or applied to the data.

Dead time corrections are required when dead time exceeds 10.5 percent. Dead time exceeded 10.5 percent in the interval from 23 to 24 ft. Maximum dead time was about 19.5 percent at 24 ft. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected in 1995 by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination

plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected from the ground surface (1 ft) to a depth of 44 ft. The range of concentrations was from the MDL (0.2 pCi/g) to 410 pCi/g, which was detected at 24 ft. ^{137}Cs was also detected near the MDL at 48 and 82 ft.

Recognizable changes in the KUT logs occurred in this borehole. Changes of 4 pCi/g or more in apparent ^{40}K concentrations occur at approximately 32 ft. The apparent 2-pCi/g decrease in ^{40}K concentrations at 38 ft occurred because of the change in sensitivity of the tool during logging. The section above 38 ft was logged in the morning while the section below 38 ft was logged at the end of the day. The increase in ^{40}K concentrations at about 32 ft may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

On the repeat log, the SGLS showed reasonable repeatability except for the log depths of 38 and 40 ft. The ^{232}Th concentration based on 2614-keV photopeak does not repeat at 38 ft (first log run). The ^{137}Cs concentration based on 662-keV photopeak does not repeat at 40 ft. The cause of these variations is probably due to the detector's decreasing efficiency throughout the day's logging.

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of gamma-emitting contamination as early as 1963 through at least 1976. The logs from 4/26/63 and 5/6/76 detected gamma activity above background from approximately 13 ft (4 m) to 39 ft (12 m). The SGLS detected ^{137}Cs within this interval.

Comparison log plots of data collected in 1995 by Westinghouse Hanford Company and in 2003 by Stoller are included. The 1995 concentration data for ^{137}Cs are decayed to the date of the SGLS logging event in January 2003. Since 1995, ^{137}Cs activities appear to have decreased as predicted by radioactive decay.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

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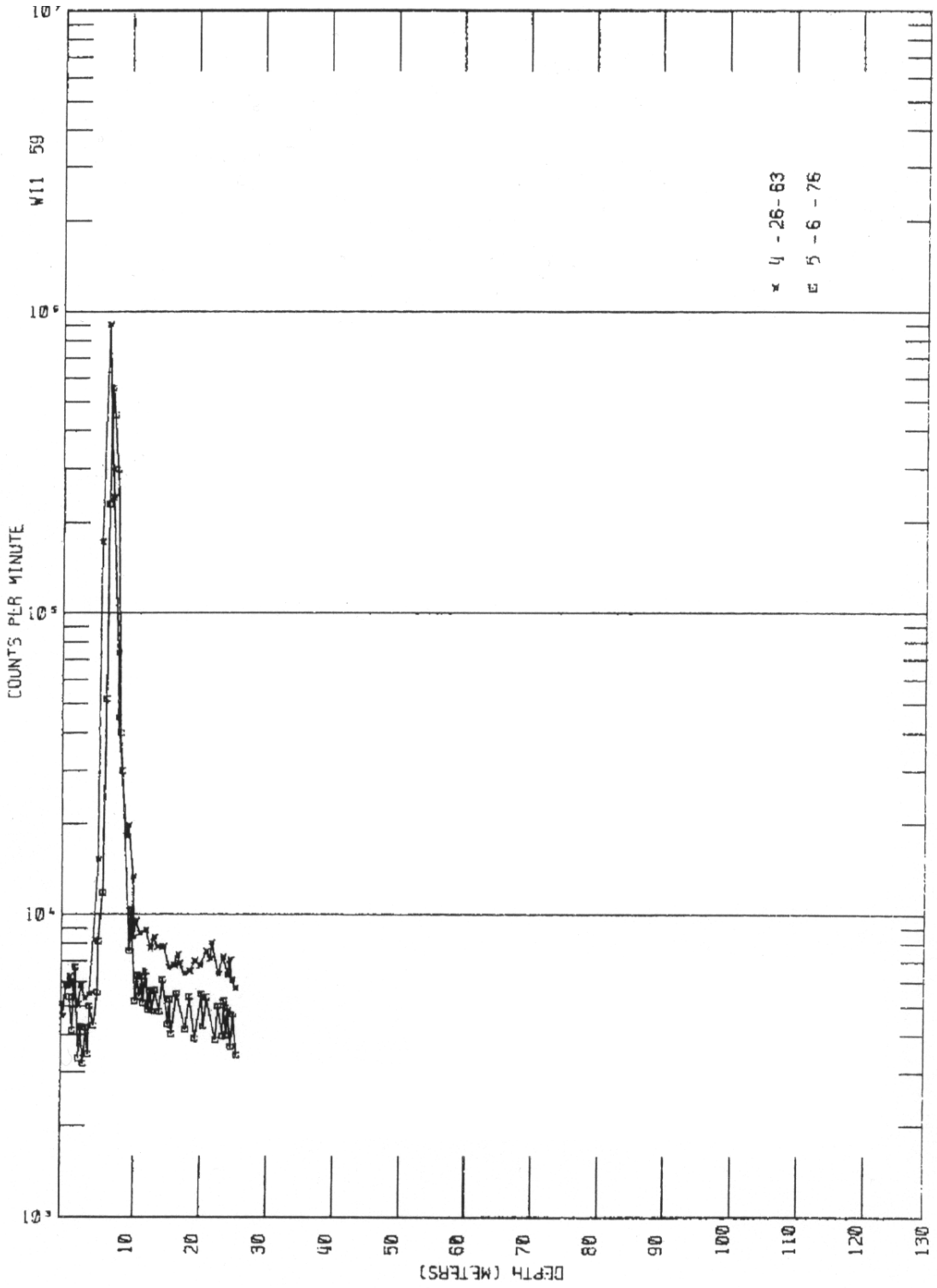
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable

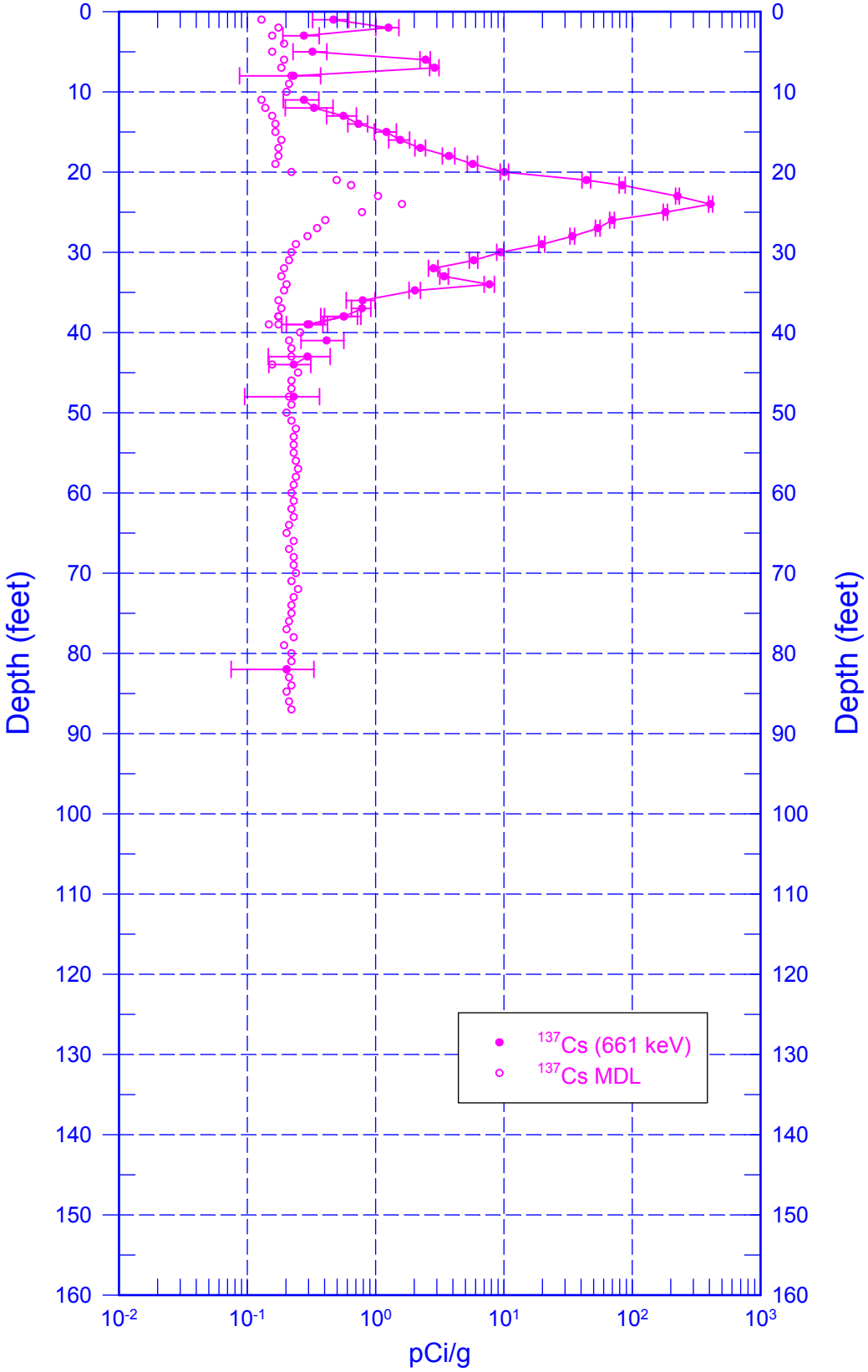


from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-W11-59, Logged on 4/26/63 and 5/6/76

299-W11-59 (A7301)

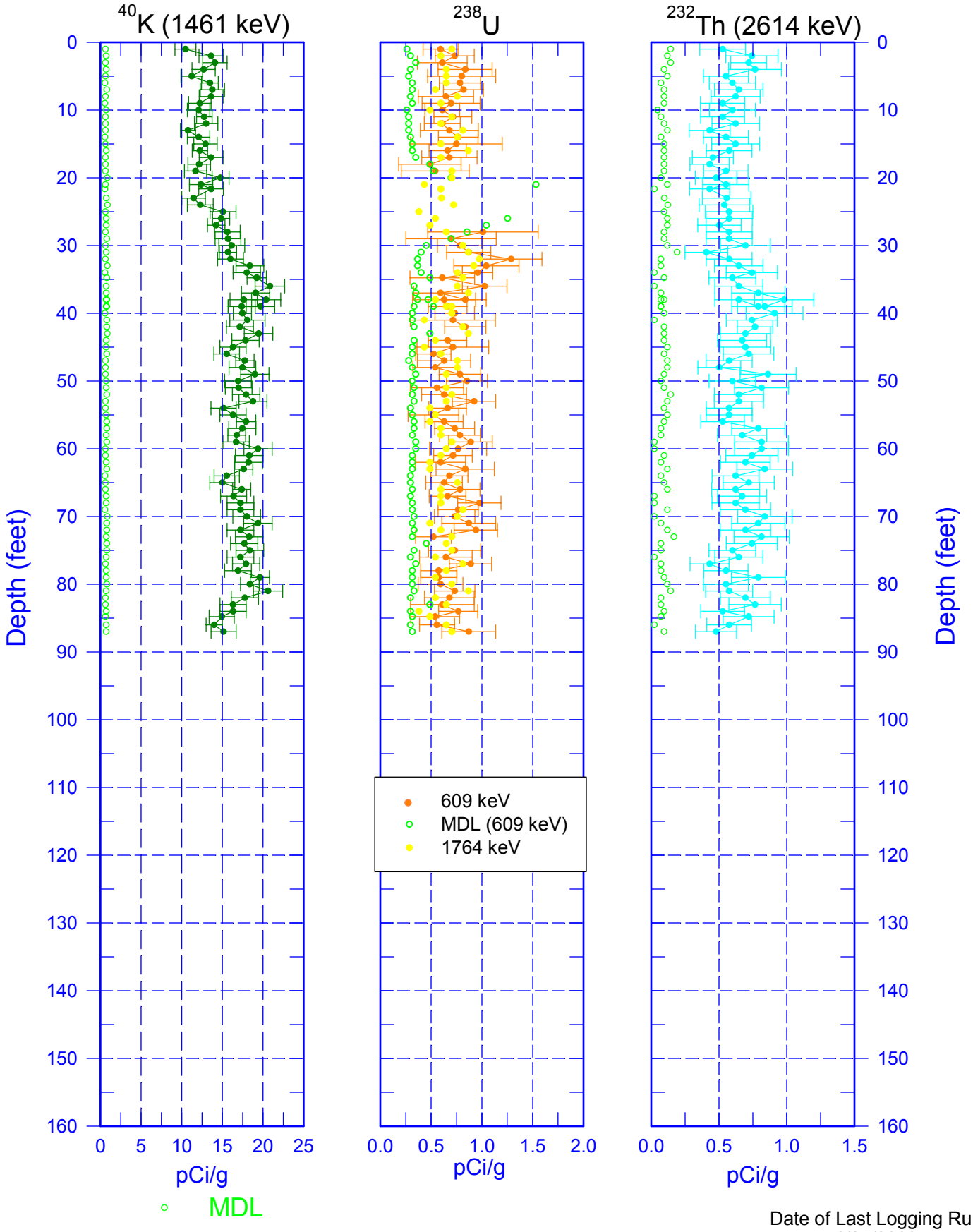
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
1/24/2003

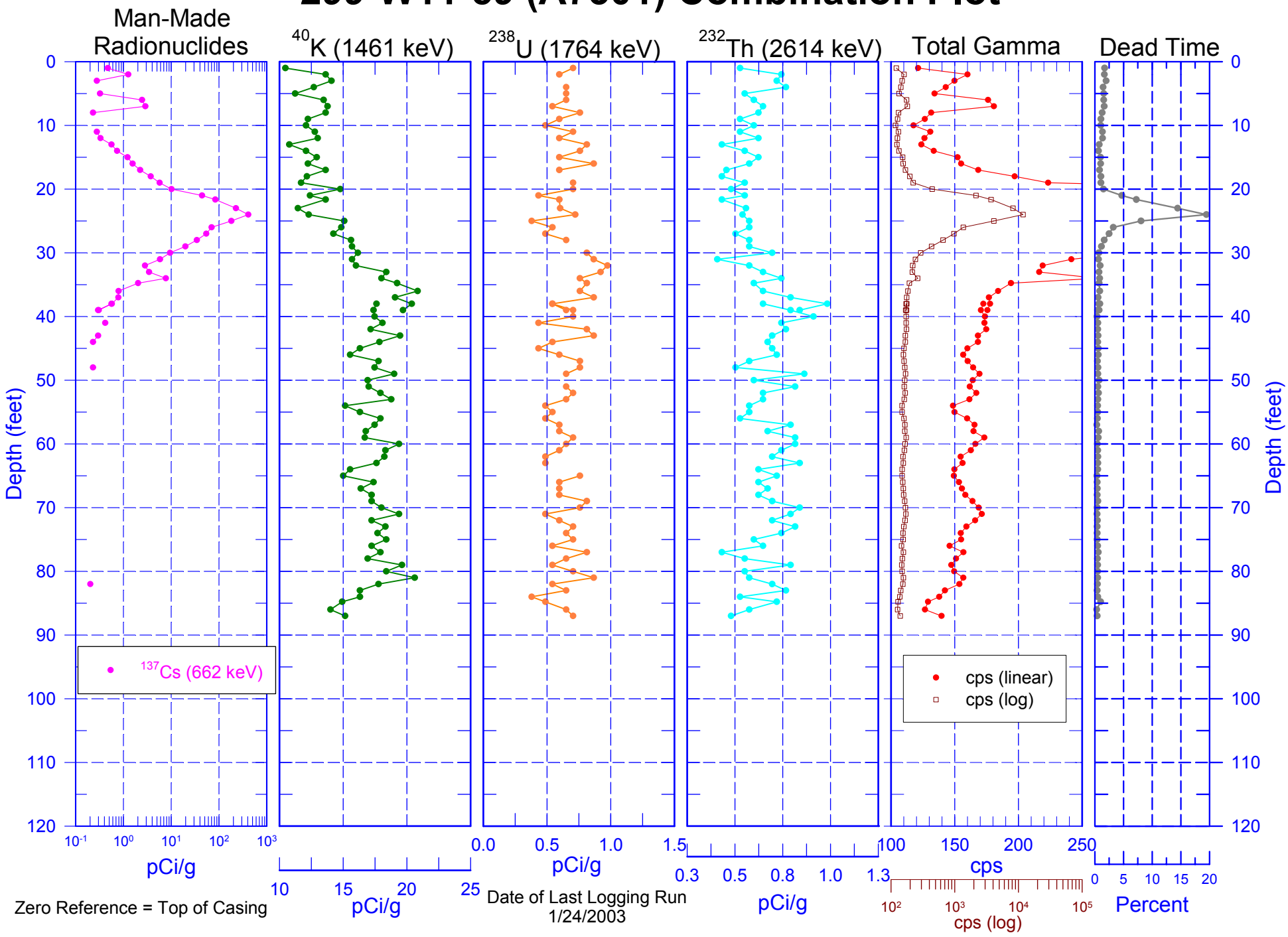
299-W11-59 (A7301)
Natural Gamma Logs



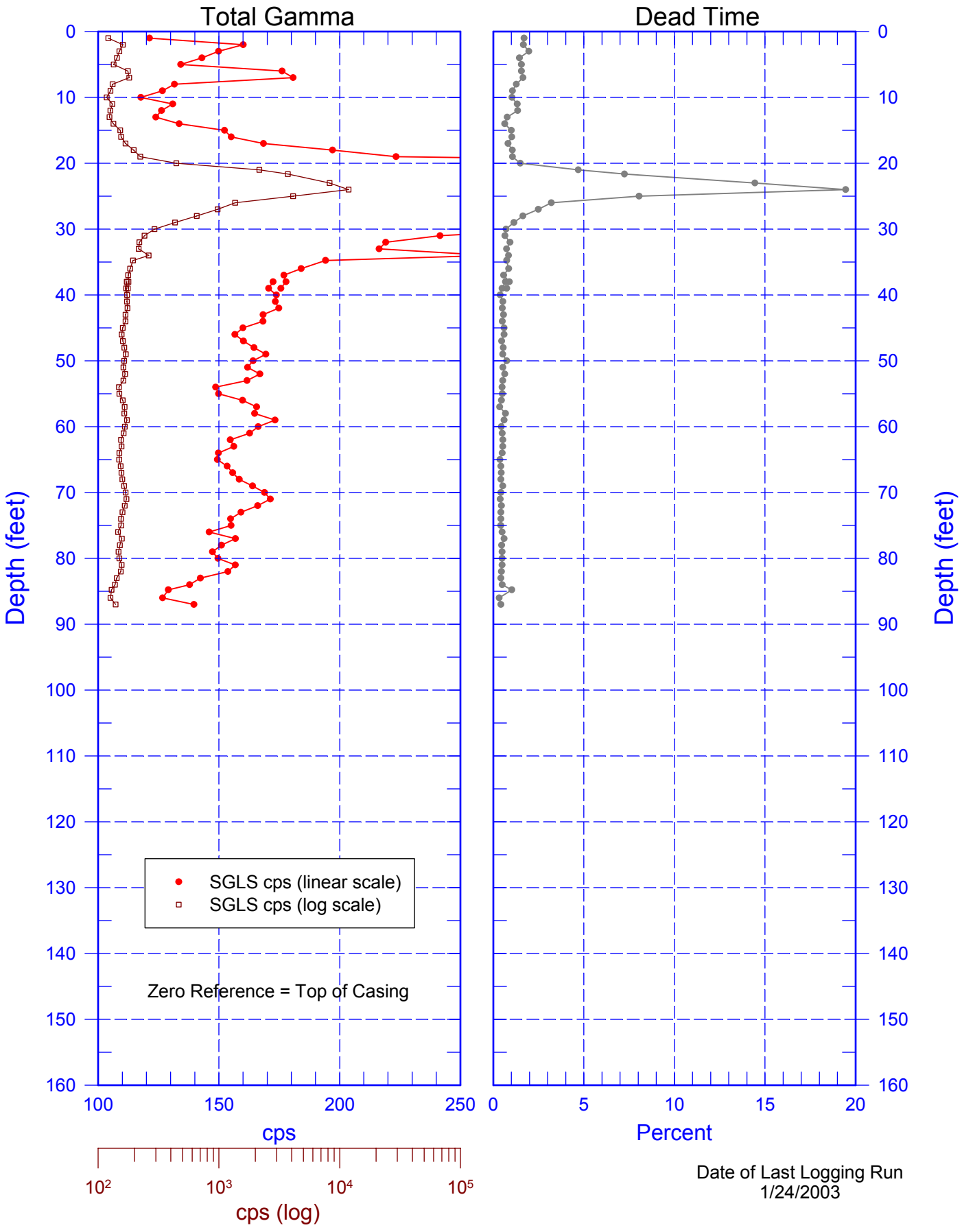
Zero Reference = Top of Casing

Date of Last Logging Run
1/24/2003

299-W11-59 (A7301) Combination Plot



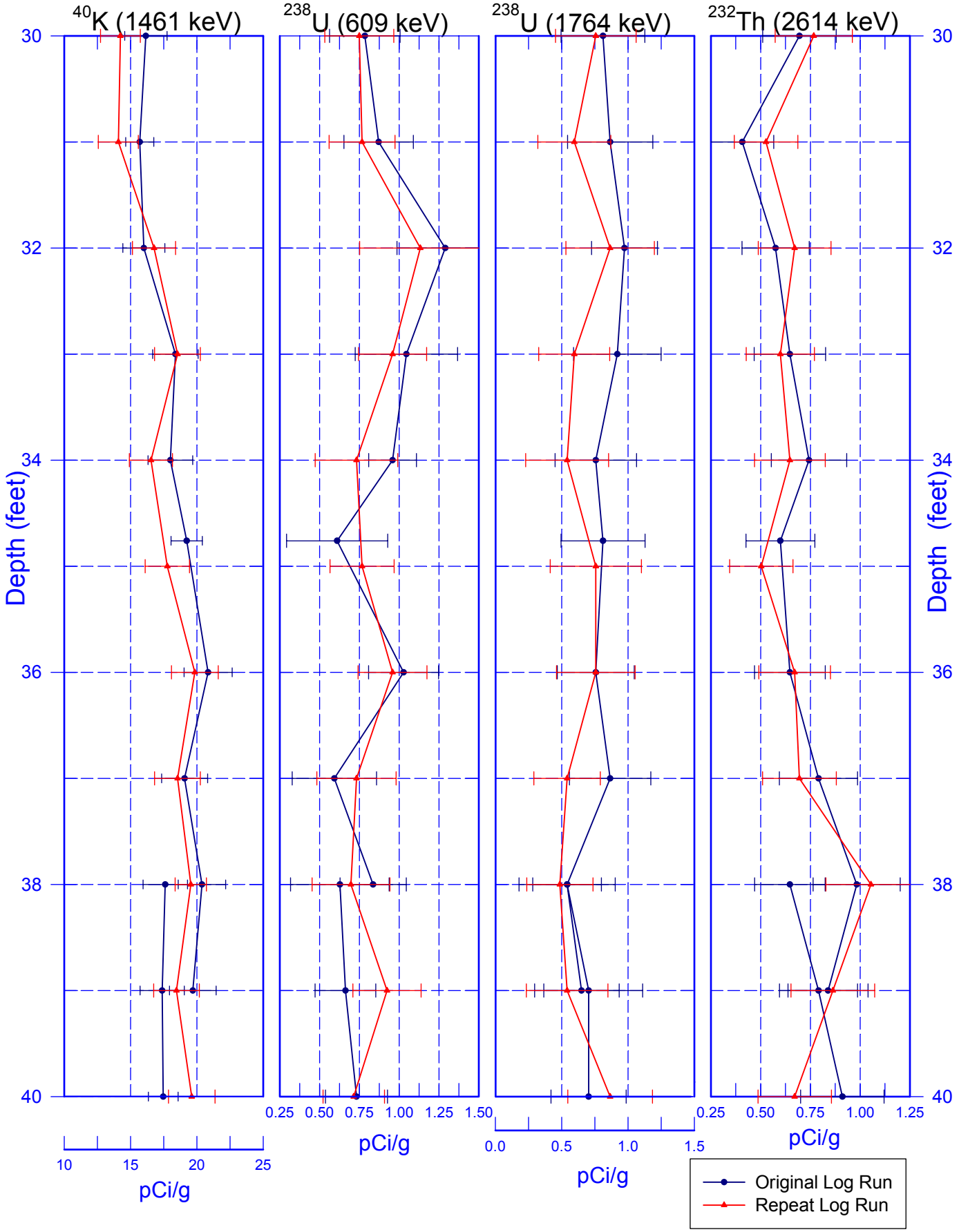
299-W11-59 (A7301)
Total Gamma & Dead Time



Date of Last Logging Run
1/24/2003

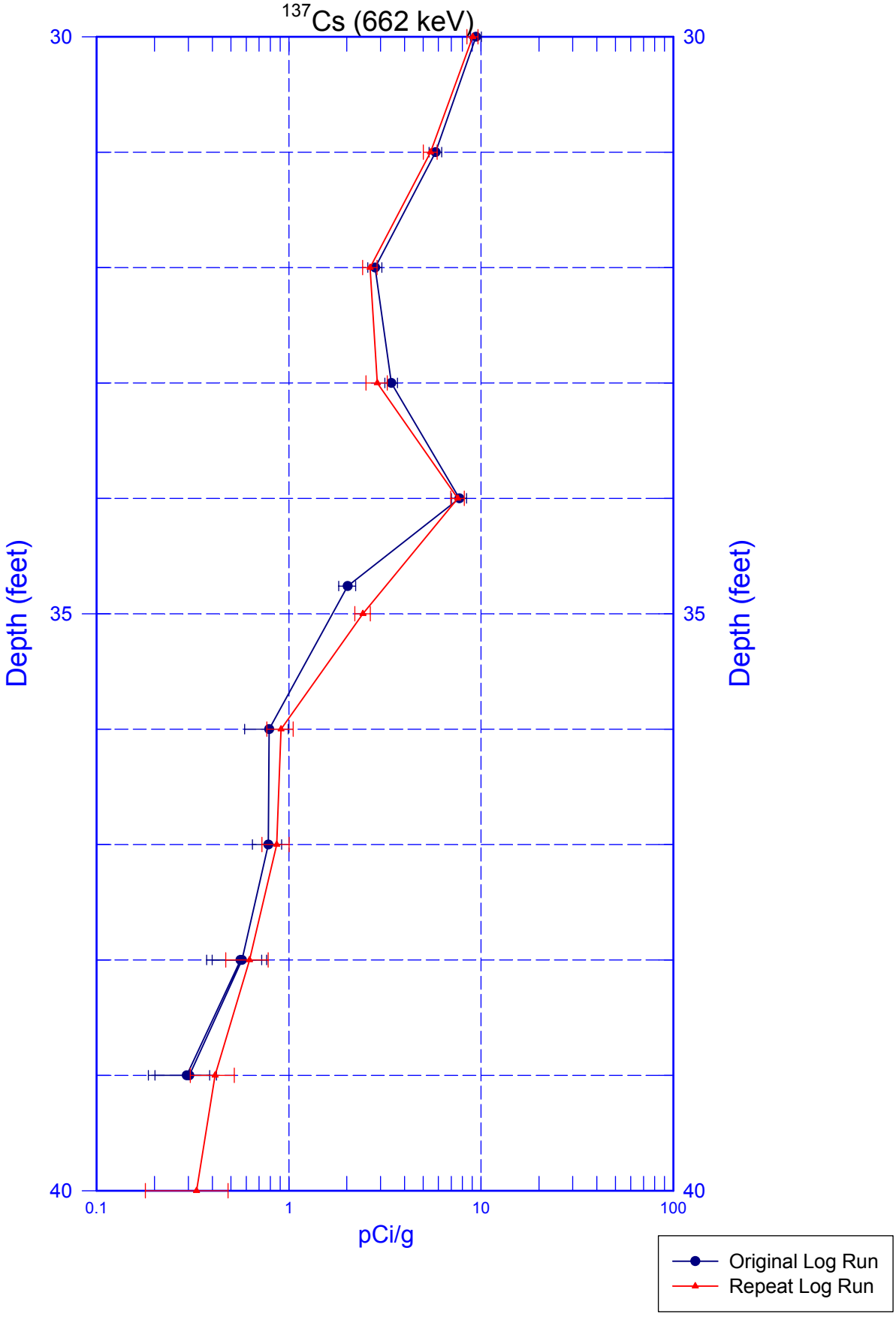
299-W11-59 (A7301)

Rerun of Natural Gamma Logs (40.0 to 30.0 ft)



299-W11-59 (A7301)

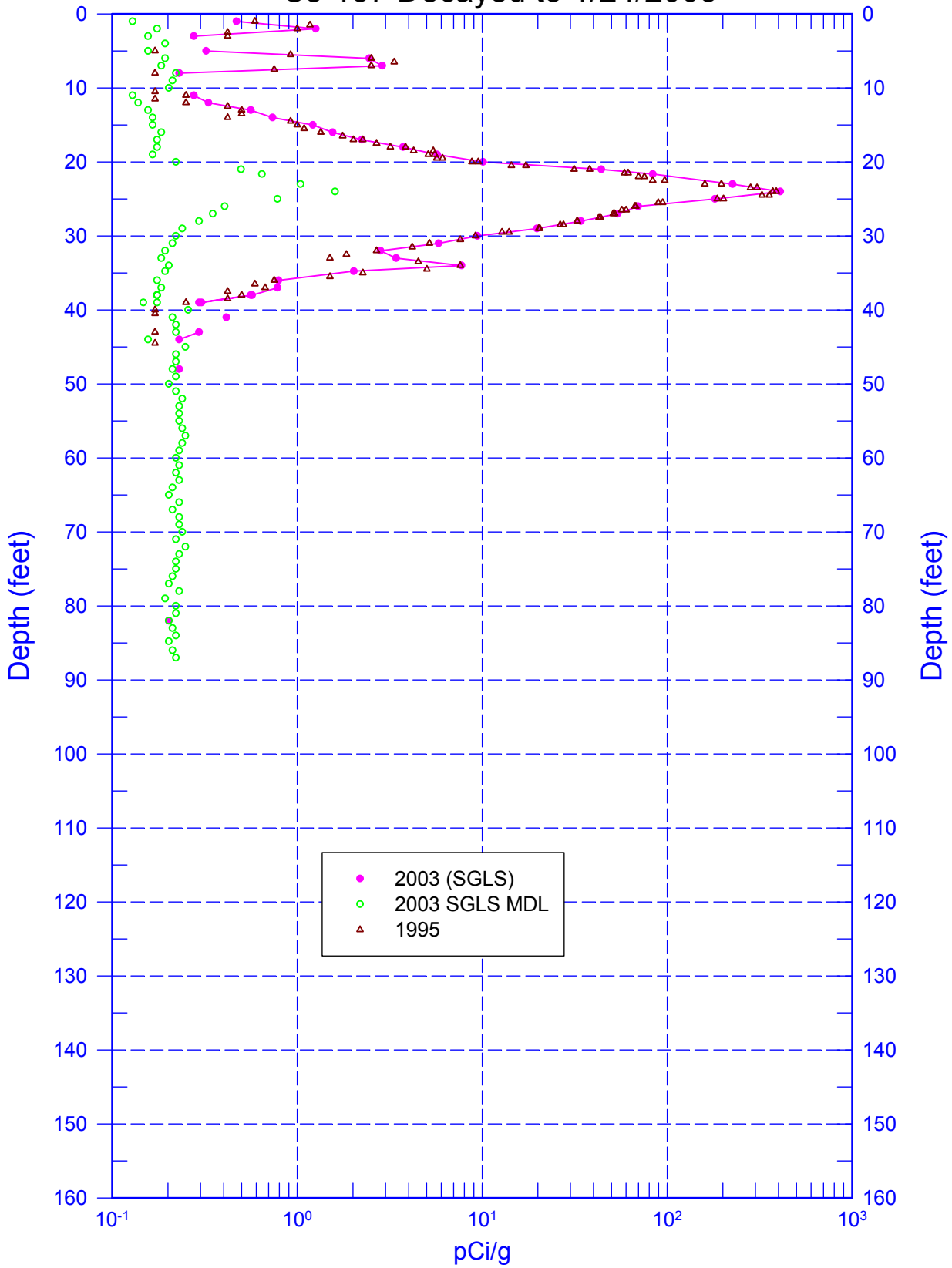
Rerun of Man-Made Radionuclides (40.0 to 30.0 ft)



299-W11-59 (A7301)

RLS Data Compared to SGLS Data

Cs-137 Decayed to 1/24/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)